

## **Coussellite, $\text{CaNa}_3\text{AlMg}_3\text{F}_{14}$ , a rhombohedral pyrochlore with 1:3 ordering in both A and B sites, from the Cleveland Mine, Tasmania, Australia**

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### **ABSTRACT**

Coussellite,  $\text{CaNa}_3\text{AlMg}_3\text{F}_{14}$ , from the Cleveland tin mine at Luina, western Tasmania, has a rhombohedral distortion of the cubic pyrochlore  $\text{A}_2\text{B}_2\text{X}_6\text{Y}$  structure, with  $a = 7.1756(1)$  Å,  $\alpha = 59.867(1)^\circ$ , space group  $R\bar{3}m$ ,  $Z = 1$ . The corresponding hexagonal cell parameters are  $a = 7.1620(1)$  Å,  $c = 17.5972(3)$  Å. The crystals are multiply twinned about threefold axes of the pseudocubic cell. The structure was determined using X-ray data collected on a twinned crystal and refined to  $R_{\text{obs}} = 0.027$  for 452 observed reflections with  $I > 2\sigma(I)$ . The structure is possibly unique among published structures of pyrochlore-like minerals in having full 1:3 ordering of Ca:Na in the A sites and Al:Mg in the B sites. Transmission electron photomicrographs show a nanodomain structure due to twinning on a scale of ~5 nm.

**Keywords:** Rhombohedral pyrochlore, new fluoride mineral, structure determination, 1:3 cation ordering in  $\text{CaNa}_3\text{AlMg}_3\text{F}_{14}$